

Assimilating efficiency of soil nutrition of *Phalaris arundinacea* L.

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Abstract: *Phalaris arundinacea* L. is fine perennial herbage of Gramineae. Eight treatments including N, P, K, NP, NK, NPK, PK and controls were done for studying its absorbing efficiency of soil nutrition. At tillering stage, the coefficient of absorbing and utilizing of N, P, and K from soil and fertilizer were analyzed according to M.K. Kaeomobk's formula and the contents of crude protein and fat were also measured. The yields of fresh crop, hay and seed were measured at ripening stage. For N absorbing coefficient of *Ph. arundinacea* from soil (Kn%), the composition PK treatment is best (12.36%) and K treatment is worse, while for N absorbing coefficient from fertilizer (Ky%), all the treatments are higher than control but the composition NPK treatment presented the highest (14.78%). For the absorbing coefficient of P from soil (Kn%), composition NK treatment is highest (19.30%), but K treatment was lower than control, while for that of P from fertilizer (Ky%), all the treatment were higher than control but the composition NP treatment showed the highest (19.52%). As to K absorbing coefficient from soil (Kn%), NP treatment is the best (19.2%) and single P treatment is worst, while for that (Ky%) of K from fertilizer the composition NPK treatment was best (28.44%). As concerns treatments for the outputs of fresh and dry crop, the composition NP treatment was best and all the treatment were higher than control. The composition NK treatment produced highest yield of seed and highest content of crude protein as compared to other treatments. For content of crude fat, the compositions NK and N treatments are best. The experiment indicates that application of fertilizer at proper proportions could increase the yield of *Ph. Arundinacea* and raise the utilizing efficiency of nourishment element from soil and fertilizer.

Keywords: Chinese Reed Canarygrass, *Phalaris arundinacea* L., Utilized coefficient, Crude protein, Crude fat.

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K 55.97 kg/hm².

Introduction

Phalaris arundinacea is an indigenous species to China. It is productive in high content of crude protein and palatable to animals and can be used as a kind of ideal parent material for hay crop breeding. In order to exploit this source and provide a scientific basis for large-scale cultivation, this species was cultivated, and its absorption coefficients of N, P, K elements from soil and fertilizer was measured.

Experimental field

This experiment was conducted in the grassland breeding plots of Zhelimu Animal Husbandry College, Inner Mongolia, China, between latitude 43°6' N and longitude 122°2' E, with an altitude of 178 m. Climate there is characterized by a mean annual temperature of 6°C, annual precipitation 350-400 mm, sunshine hours 2800-3700 h per year, and frost free season 146 d. The former plant of experimental plot is Chinese Crabapple and the cultivating layer is light loam with pH 8.7. The content of nitric N is 33.58 kg/hm², amino N 42.54 kg/hm², organic P 5.6 kg/hm²,

Materials and methods

The wild ripened seeds were collected and sown on the experimental field. The Clone that was established 2 years after cultivation in April was random arrangement. The treatments of N, P, K, NP, NK, NPK, PK and controls were set up, with three replications, in each experimental plot of 1 m × 10 m, spacing 0.5 m × 0.5 m. Fertilizer application is 33.8 g per plot by N, P, K elements. The coefficient of absorbing and utilizing of N, P, and K from soil and fertilizer were analyzed according to M.K. Kaeomobk's formula ($K_n = B_{dy}/C_{ux} \times 100\%$, $K_y = B_{np}/B_{x} \times 100\%$).

Results and analysis

Utilization of nitrogen (N)

For Nitrogen absorbing coefficient of *Ph. arundinacea* from soil (Kn%), PK treatment was the highest and the K treatment was the lowest (Table 1). The reason for lowest Kn% with K treatment was that there existed plenty of K in soil already; hence the application of K would cause the N and P to be relatively insufficient and reduce the absorption and utilization of N from soil.

As to the N utilized coefficient of *Ph. arundinacea* from fertilizer (Ky%), the NPK treatment was best (Table 1). Application NPK compound fertilizer increased the Ky of N from fertilizer and supplement of more N and NP to plants could improve the absorption of N.

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Table 1. Utilized coefficients of N from soil (Kn%) and fertilizer (Ky%)

Treatments	Kn%	Treatments	Ky%
K	10.42	N	11.26
PK	12.36	NP	11.12
P	11.43	NK	10.94
CK	11.09	NPK	14.78
		CK	11.09

Utilization of phosphorus (P)

For P absorbing coefficient of *Ph. arundinacea* from soil (Kn%), the composition NK treatment brought about highest Kn (19.30%), but K treatment was lower than control (Table 2), while for utilization of P from fertilizer (Ky%), all the treatment were higher than control but the composition NP treatment showed the highest (19.52%) (Table 2)

Table 3. Utilized coefficients of phosphorus from soil (Kn%) and fertilizer (Ky%)

Treatments	Kn%	Treatments	Ky%
N	18.63	NP	19.52
NK	19.30	NPK	19.30
K	12.68	PK	19.52
CK	16.30	P	18.50
		CK	16.30

Absorption and utilization of potassium (K)

For K absorbing coefficient from soil (Kn%), NP treatment is the best (19.2%) and single P treatment is worst

Table 4. The yields of fresh and dry plants, seed weight, crude protein content, and crude fat content of *Ph. arundinacea* by different treatments

Item	N	NP	NK	NPK	PK	P	K	CK
Fresh crop, t/hm ²	39.189	46.793	35.247	36.048	38.419	36.938	30.915	30.815
Hay, t/hm ²	25.432	33.897	25.743	26.703	23.661	25.237	21.520	20.540
Seed weight, t/hm ²	0.105	0.162	0.232	0.177	0.177	0.141	0.162	0.075
Crude protein content %	22.83	19.75		18.92	17.51	18.40	18.34	16.80
Crude fat content %	6.20	6.00	6.20	4.50	4.70	4.50	4.90	5.50

Conclusions

Application of P and K mixed fertilizer can improve the nitrogen absorption and utilized coefficient of *ph. arundinacea* plants from soil. Application of N, P, K compound fertilizer can raise the nitrogen-utilized coefficient from fertilizer. N and K mixed fertilizer can improve phosphorus absorption and utilized coefficient from soil; while the N and P mixed fertilizer can raise the utilized coefficient of phosphorus from fertilizer. Application of N and P mixed fertilizer can improve potassium absorption and utilized coefficient from soil; while the N, P, and K compound can raise the potassium utilized coefficient from fertilizer.

Application of N, P mixed fertilizer to *ph. arundinacea* plants can produce the highest yields of fresh crop and hay, while the N, K fertilizer application gets the highest seed

(Table 3), while for that (Ky%) of K from fertilizer the composition NPK treatment was best (28.44%). From Table 3, it is said that proper application of N and P mixed fertilizer could improve the absorption of potassium and that given adequate N and P, and added a small quantity of potassium could increase the Ky% of K. But the Ky% of K treatment was much lower than that of control, which indicated that application of single K fertilizer to soil with enough K would cause unfavorable effects.

Table 3. Utilized coefficients of potassium from soil (Kn%) and fertilizer (Ky%)

Treatments	Kn%	Treatments	Ky%
N	18.12	NK	26.77
NP	19.20	NPK	28.44
P	12.27	PK	23.27
CK	16.30	K	5.85
		CK	16.30

Yields of fresh crop and hay, seed weight, crude protein content, and crude fat content

As concerns treatments for the outputs of fresh and dry crop of *Ph. arundinacea*, the composition NP treatment was best and outputs with all the treatments were higher than that of control. The composition NK treatment produced highest yield of seed and highest content of crude protein as compared to other treatments. For content of crude fat, the compositions NK and N treatments are best (Table 7).

weight per unit area. The highest crude protein content of *ph. Arundinacea* plants comes from those applied with N, K mixed fertilizer, while the highest crude fat content plants from those applied with N, K mixed fertilizer or N fertilizer.

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